

Project Title: Optimizing Heart and Brain Cooling During Cardiac Arrest

Sponsor: National Heart, Lung and Blood Institute/ BRP

# Emergency Resuscitation Center

A Bioengineering & Medical Research Partnership

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Development of Ice Slurry Human Coolants and Medical Protocols  
For Rapid Induction of Brain/Heart/Organ Cell Protective Hypothermia



## Slurry Characteristics

--Water phase (% wt)	50-75%
--Ice phase (% wt)	25-50%
--NaCl (% wt)	0.9%
--Particle size	0.1 mm
--Particle shape	globular
--Surface	smooth
--Temperature	-0.3-(-1.2) °C
--Flowability	good

water  $\Delta 1^{\circ}\text{C} = 1\text{cal/g}$   
melt ice = 80 cal/g

## Status Year 2

- Developed calorimetry to measure slurry ice content
- Established use of fluorescent micro-spheres to measure regional blood flow partition
- Developed ability to make slurry onsite/on-demand of 42% ice
- Experiments with IV cooling (50 ml/kg) showed slurry (20% ice) cools brain more rapidly/deeper than cold saline and decreases bolus volume necessary to achieve hypothermia (brain  $\Delta 4^{\circ}\text{C}$ )
- Experiments confirmed GI slurry (40% ice) cooling effectiveness using modified gastric tube at 30ml/kg bolus
- Performed confirmatory pilot exp. using intra-peritoneal ice slurry cooling

## Possible Administration

IV

Naso-gastric tube

Intra-peritoneal

Intra-pulmonary (PFC)

## Swine Model

Instrumented

Temp probes

CA or NL circulation

